

# The IUNS cross-cultural study of "Food Habits In Later Life"-- an overview of key findings

Wahlqvist ML, Hsu-Hage BH-H, Kouris-Blazos A, Lukito W and IUNS study investigators:

IUNS Committee on "Nutrition and Aging": ML Wahlqvist (Chairman), L Davies (Deputy chairman), BH-H Hsu-Hage, Y Horie, H Hermanova, A Kouris-Blazos, DM Prinsley, D Roe, NS Scrimshaw, N Solomons, B Steen, M-T Sun, A Trichopoulou, WA van Staveren, X-H Zhao;

*Anglo-Celtic Australians: ML Wahlqvist, A Kouris-Blazos, BH-H Hsu-Hage, W Lukito; Greek Australians: A Kouris-Blazos, ML Wahlqvist; Greeks in Spata, Greece: A Kouris-Blazos, A Trichopoulou, E Polychronopoulos, ML Wahlqvist; Swedes in Gothenberg, Sweden: B Steen, E Rothenberg, O Augustsson, BG Eriksson, V Sundh, B Warne; Japanese in Japan: Y Horie, K Horie, K Sugase, R Inai, Y Kasugai, T Teshima, H Nishikawa; Filipinos in Manila, Philippines: P de Guzman; Chinese in Beijing, China: D Roe, Y Wang; Chinese in rural and urban Tianjin, China: S Xi, M-T Sun, G-F Gu.*

The need to understand the nutritionally related health problems of elderly people in developing countries became more apparent following a WHO Workshop in Hyderabad, India, in 1986. On behalf of WHO, Dr Gary Andrews published a study of the social and health status of elderly people in the Western Pacific in 1986. For all of the difficulties in cross-cultural comparisons, there were enough great and important differences in social factors and self-perceived health indicators to make a case for further cross-cultural studies on a wider international scale.

The IUNS Committee on "Nutrition and Aging" began to address the way in which the cross-cultural aspects of nutritional assessment and the social and health status methods could be applied using the socio-anthropological approaches. A project to study "Food Habits In Later Life" was formulated. Communities where there was a concentration on food culture and its relationship to health were recruited into the project to be assessed non-invasively, without the limitations that collection of biological specimens might impose. Results from 13 elderly communities in Australia, China, Greece, Japan, the Philippines, and Sweden studied in 1988-1992 have now been documented in book form. This book also brings together some cross-cultural studies of the elderly which have considered food and health at the same time as the IUNS project: these studies are the EC SENECA study, a study by the National Institute of Nutrition and Food Hygiene in Beijing of six Chinese communities with distinctive food patterns, a New Zealand-Australian study of two communities and studies in Central America. The IUNS study itself has the attributes of an ecological investigation and the related limitations. The ethnological and anthropological focus, however, represents an advantage in that the range of variation of the nutritional exposure under consideration is much greater among populations than within any particular population. The IUNS study is unique in the scope of the variables studied. Some of these study communities will be followed prospectively to take advantage of what a cohort study can provide in the elderly.

## Historical background

In 1988, the International Union of Nutritional Sciences (IUNS) Committee on Nutrition and Aging (II-8) undertook to coordinate cross-cultural studies of food habits and health in later life with the following objectives:

- 1) to describe health status, lifestyle and the range of food habits (present and past), amongst the aged in developed and developing countries, and
- 2) to determine to what extent food habits and lifestyle variables predict health status in the aged.

The principal hypothesis is that it is possible for comparable health status to be achieved by people in later life, having eaten, and continuing to eat in quite different ways from each other. We cannot, however, comment on

the nature of survivorship from a nutritional point of view for those of whom die prematurely, before the age of 70, or before the upper age stratum in a community where life expectancy is relatively short. Nevertheless, our assumption is that achievement of optimal health status by nutritional means is worthy of consideration amongst the aged in its own right<sup>18</sup>.

Results from 13 elderly communities, giving a total of 2013 subjects, have now been descriptively documented in book form, fulfilling the first objective of the study<sup>16</sup>.

**Correspondence address:** Professor Mark Wahlqvist, Monash University, Dept of Medicine, 246 Clayton Road Block E, Level 5, Clayton, 3168, Victoria, Australia  
Tel: +61-3-9550-5525 Fax: +61-3-9550-5524

Additionally, similar studies undertaken by EURONUT-SENECA group<sup>3</sup>, Horwath and colleagues in Australia and New Zealand<sup>8-10</sup>, and the Institute of Nutrition and Food Hygiene in Beijing, China, are also included, comprising 27 centres in all.

The value of the book is that it brought together variables from all of these centres for comparison. The variables included socio-demography, health status, food intakes, food beliefs and habits, nutrient intakes, anthropometry, social network and factors, and lifestyle. The IUNS study is unique in scope and will provide researchers with data on how elderly people are eating in various communities and factors affecting food intake and health. The book provides a reference point in approaches and methodology for the study of nutrition and aging in various communities.

The objectives of this paper are:

- 1) to report methodology developed for the IUNS study of "Food habits in later life: Cross-cultural approaches" with special references to health status, food intakes, social factors, and lifestyle, and
- 2) to present key findings related to the general investigation of food habits and health status.

## Methods

### Study communities and subjects

Representative samples of 13 elderly communities, aged 70 years and over (or where this has not been the upper decile of the population, a age less than 70 years) were studied, drawing from Australia (rural Aboriginal, urban

Anglo-Celtic, and urban Greek Australians), China (urban Beijing, and rural and urban Tianjin Chinese), Greece (rural Spata Greeks), Japan (semi-urban Okazaki, urban Hiroshima, semi-urban Kumamoto, and urban Yokohama Japanese), Philippines (urban Manila Filipinos), and Sweden (urban Gothenberg Swedes). Elderly participants were representative of the community being studied, but not of the entire country. Subjects were randomly selected from the telephone directory, register or electoral rolls. Psycho-geriatric patients in nursing homes and subjects unable to answer questions independently were excluded from the study. All study centres aimed for a participation rate of at least 60%. Community characteristics and sample size are shown in Table 1.

For each community, young and old elderly was defined. In communities where 70 years of age was the lowest limit for entry, the young elderly were those who aged less than 80 years, and the old elderly were those who aged 80 years and over. In communities where the upper decile of the community was aged below 70 years, the young elderly were those aged less than 70 years, and the old elderly were those aged 70 years and over. The age range for each study community is shown in Table 2.

Interviewer administered questionnaires, anthropometric measurements, blood pressure, and blood tests were employed to collect individual data. Questionnaire information was available from all study communities. In some centres, anthropometric measurements, blood pressure, and blood tests were also performed (Table 3).

**Table 1.** Participating Communities: community code, location, ethnicity, and sample size (men, women and total)

Code	Location	Rural or Urban	Ethnicity	Sample Size						
				Men		Women		Combined		Total
				young	old	young	old	young	old	
ABOR*	Fitzroy Crossing, Australia	rural	Aboriginal	16	4	16	7	32	11	43
ACA	Melbourne, Australia	urban	Anglo-Celtic	42	7	40	6	82	13	95
GRK-M	Melbourne, Australia	urban	Greeks	66	28	59	36	125	64	189
GRK-S	Spata, Greece	rural	Greeks	32	19	31	22	63	41	104
SWE	Gothenburg, Sweden	urban	Swedes	52	21	80	64	132	85	217
FIL*	Manila, Philippines	urban	Filipinos	33	41	109	98	142	139	281
JPN-O	Okazaki, Japan	semi-urban	Japanese	28	15	33	13	61	28	89
JPN-H	Hiroshima, Japan	urban	Japanese		37		53		90	
JPN-K	Kumamoto, Japan	semi-urban	Japanese		43		48		91	
JPN-Y	Yokohama, Japan	urban	Japanese		28		40		68	
CBJ*	Beijing, China	urban	Chinese	80	45	124	56	204	101	305
CTJ-R	Tianjin, China	rural	Chinese	73	10	79	19	152	29	181
CTJ-U	Tianjin, China	urban	Chinese	107	19	102	32	209	51	260
Total				846		1167		2013		

\* the upper decile of the community was sampled, 50 years and over for Beijing women and Aboriginal Australians, and 55 years and over for Beijing men and Filipinos.

**Table 2.** Age range, by study community

	ABOR	ACA	GRK-M	GRK-S	SWE	FIL	JPN-O	CBJ	CTJ-R	CTJ-U
<b>Men:</b>										
Young elderly	50-70	70-79	70-79	70-79	69-79	57-69	70-78	57-69	70-79	70-79
Old elderly	70-80	80-84	80-97	80-91	80-91	70-83	80-91	70-88	80-89	80-87
Total	50-80	70-84	70-97	70-91	69-91	57-83	70-91	57-88	70-89	70-87
<b>Women:</b>										
Young elderly	50-70	70-79	70-79	70-78	69-79	58-69	70-79	53-69	70-79	70-79
Old elderly	70-80	80-94	80-104	80-94	80-96	70-91	80-87	70-95	80-94	80-96
Total	50-80	70-94	70-104	70-94	69-96	58-91	70-87	53-95	70-94	70-96

\*relative age was obtained based upon members of the community

**Table 3.** Information gathered, by study community

	ABOR	ACA	GRK M&S	SWE	FIL	JPN H,K,O & Y	CBJ	CTJ R&U
Questionnaires	yes*	IUNS/mod	IUNS	IUNS	IUNS	IUNS		
Food intake	yes*	FFQ	FFQ	FFQ	24-hr FFQ	3-d 24-hr	24-hr FFQ	3-d 24-hr
Anthropometry	WT,HT, BMI,WHR TSF	all	all	all	WT, HT, BMI	WT, HT, BMI, WHR	all exc WHR	all
Blood pressure	no	yes	yes	yes	yes?	no	yes	yes
Blood tests	no	yes	yes	yes	yes?	no	no	no

\* RAP was used to obtain demographic and community food intake information; ? not available to the present paper

#### *Interviewer administered questionnaires*

The interviewer administered questionnaires were designed for the study on health status, food habits, social factors and lifestyle<sup>17</sup>. Questions were adapted from previously trialled questionnaires used in elderly studies, such as the Multi-level Assessment Instrument<sup>12</sup> which included validated health scores, the WHO Eleven County Study in Europe<sup>6</sup>, the WHO Four Country Study in the Western Pacific<sup>1</sup>, and EURONUT-SENECA study in 19 European centres<sup>3</sup>. Apart from the health scores, all other scores (exercise, activities of daily living, medication, well-being, memory social activity, social networks) were developed for the study. In all cases a higher score was a better score.

#### **The questionnaires covered the following aspects:**

##### Health status

Health status included questions or a set of questions so that the following aspects could be assessed as an aggregate:

- 1) self-rated health,
- 2) self-reported health conditions,
- 3) self-reported medication use,
- 4) well-being, and
- 5) memory.

Both individual questions and the aggregate were used to identify potential differences in health status between the study communities.

The health section of the Multi-level Assessment Instrument (MAI)<sup>12</sup> was used to obtain information in self-rated health, health behaviour and health conditions. The self-rated health section consisted of four questions, describing how one would rate their overall health at present, and the aggregate gave a score of 4 to 13. The health behaviour section consisted of three questions in relation to the use of medical services (such as frequency of physician visits). The aggregate gave a health behaviour score of 3 to 9. The self-reported health conditions section consisted of a 23 item check-list of common health conditions, including diabetes, high blood pressure, eyesight and hearing, and whether limbs were missing or handicapped. The aggregate gave a self-reported health condition score of 25 to 50. A non-index item, describing the use of a wheel chair, gave a score of 1 to 2. A total health score was then obtained by adding these scores together. They ranged from 33 to 74.

The self-reported medication use was assessed using a 21 item check-list of the Older American Research Services (OARS) questionnaire<sup>17</sup>; the aggregate gave a

score of 21 to 42. Questions were also asked on vitamin supplements and the use of various health aids, such as canes, hearing aids, and so on.

Well-being, describing feelings of worry, depression, tiredness, sleeplessness, and contentness with life, was assessed using a 7 item questionnaire of the WHO Western Pacific Study, by Andrews and colleagues<sup>1</sup>. The aggregate gave a well-being score of 0 to 7.

The memory of the elderly was tested with basic questions regarding their recall of their address, the date and whether they felt they were more forgetful now compared with the past. Also adopted from the WHO Western Pacific Study<sup>1</sup> was a 5 item questionnaire in relation to ability to recall correct year, month and day of the week, home address and whether or not there was a feeling of forgetfulness of people's names. The aggregate gave a memory score of 0 to 5.

##### Food habits

The usual food intake, distant past food intake, food and health beliefs, cooking methods, facilities, eating environment, and eating difficulties were inquired so that food habits pertaining to individual elderly could be assessed.

Anthropological methods (Rapid Assessment Procedures) were used<sup>13</sup> to obtain information on food and health beliefs and to examine further other factors possibly affecting food intake<sup>11,14,15</sup>. The food habits questionnaire development encouraged the expression of food culture of the study communities and, within the framework of food habits inquiries, allowed for modification.

The food frequency questionnaire (FFQ) was used in study communities where seasonal intake of foods was evident (Australia, Greece, and Sweden). Questionnaire food items were modified in accordance with local food supply and cultural food preferences. A three consecutive day 24-hour recall method was used in the Chinese and Japanese study communities where the use of FFQ had not been used previously and was virtually untested during the early development of this study. The FFQ methodology relies on the use of standard portion size to estimate usual intake which is possible for communities of European food culture, but not the traditional Asian food cultures where foods are placed in the centre of the meal table, principally served to and shared amongst the extended family members.

Nutrient intake data was analysed using country specific food composition tables. Micro-nutrient intakes were compared with two thirds of the US RDAs in order to

assess adequacy of intake. Due to differences in country specific food composition tables, certain nutrients were not available such as zinc and magnesium for Chinese and Japanese elderly, and folacin, vitamin B6 and vitamin B12 for most study subjects. Nevertheless, a qualitative assessment of intake was made by identifying foods consumed which are good sources of these nutrients.

Food intake data derived from the FFQ or 3 day recalls were categorised into 13 major food groups and 43 food subgroups. In this report, the usual food intakes (in grams per day) are reported for selected food groups. The food intake variety was calculated based on the 43 food subgroups<sup>7</sup>. Energy intake, the percentage of energy from carbohydrate and fat intakes, and the percentage below two thirds of the US RDA for retinol equivalent and thiamin intakes were reported.

#### Social factors

Social factors, including social activity, network and support, adopted questions from the Multi-level Assessment Instrument (MAI)<sup>12</sup>. The questions were available to the Greeks (GRK-M and GRK-S), the Swedes and the Japanese (JPN-O), and modified for use in the Anglo-Celtic Australians and Chinese in Beijing and Tianjin.

Social activity, aiming to assess ways of spending time on meetings, church congregation, and personal hobbies, consisted of 22 questions. The aggregate gave a social activity score of 22 to 176. Social networks consisted of 12 questions in relation to contact with friends and relatives, and feelings of loneliness or degree of support. The aggregate gave a social network score of 12 to 46.

#### Lifestyle

Activities of daily living, exercise, sleep, and substance abuse were inquired and aimed to explore the cross-cultural circumstance of lifestyle in the various elderly communities.

Activities of daily living (ADL) questions were adopted from the WHO Eleven Country Study<sup>6</sup>. The questions consisted a 14 item check-list inquiring degrees of difficulty with basic bodily functions and performing basic tasks, such as using the toilet, eating, and walking between rooms. The aggregate gave an ADL score of 15 to 62.

Questions on how often does one go out of the house or building and how many hours/ minutes spent per day or week doing various activities were asked to assess exercise pattern. The aggregate gave an exercise score of 1 to 7. Questions relating to sleep patterns, including time of waking and sleeping, number of hours sleep per night, and whether or not they nap during the day, were asked. Smoking habits and alcohol consumption were also asked.

#### Anthropometry

A standard protocol was developed for use in the study. Not all study centres had a complete set of anthropometric data (Table 3). Where the collection of anthropometric data was possible, the study protocol was followed. All measurements were measured twice and included:

1. Body weight: in kilograms to the nearest 0.5kg, with light clothes on;
2. Stature: in centimetres to the nearest 0.5cm, in standing position with socks and shoes removed;
3. Body mass index (BMI): calculated as weight in kilograms divided by stature in meter squared ( $\text{kg}/\text{m}^2$ );
4. Waist circumference: at the level of umbilicus in centimetres to the nearest 0.5cm, with light clothes on, in standing position with abdomen relaxed, arms at the sides, feet together and weight equally divided over both legs;
5. Hip circumference: at the level of maximal gluteal protrusion in centimetres to the nearest 0.5cm, with light clothes on, in standing position with abdomen relaxed, arms at the sides, feet together and weight equally divided over both legs;
6. Waist-to-hip circumference ratio (WHR)<sup>2</sup>: calculated as waist circumference divided by hip circumference;
7. Mid arm circumference (MAC): in centimetres to the nearest 0.5cm, in standing position, with sleeves removed, arm relaxed, and legs apart;
8. Skinfold thicknesses: triceps (TSF), biceps, suprailiac and subscapular in millimetres using a Harpenden or Holtain caliper (the two agree reasonably well);
9. Mid arm muscle circumference (MAMC): calculated using the following equation:  

$$\text{MAMC} = \text{MAC} - (3.14 \times \text{TSF})$$
 where MAC equals mid arm circumference and TSF equals triceps skinfold thickness
10. Mid arm muscle area (MAMA)  

$$\text{MAMA} = [\text{MAC} - (3.14 \times \text{TSF})]^2 / 12.56$$
 where MAC equals mid arm circumference and TSF equals triceps skinfold thickness
11. Fat free mass (FFM) in kilograms, total body fat (TBF) in kilograms, and percentage body fat<sup>4</sup>: estimated using body weight, stature, age, and gender; the approach makes it possible to compare body fatness amongst the study communities because more direct measures were not available from all centres; the formula is as follows:  

$$\text{FFM} = 0.395 \times \text{WT} + 0.282 \times \text{ST} + 8.4 \times \text{gender} - 0.144 \times \text{age} - 23.6;$$
 where WT is body weight in kilograms, ST is stature in centimetres, gender equals 1 for men and 0 for women, and age in years.

#### Blood pressure

Blood pressure was measured twice from the right arm, with elderly resting in a sitting position. The Korotkoff's phase I and V were recorded for systolic and diastolic pressure, respectively. Blood pressure data were available from most study communities, except for the Aboriginal Australians and the Japanese.

#### Blood tests

Fasting venous blood were sampled from the Anglo-Celtic and Greek Australians, and the Swedes. Biological markers included:

1. Haematology: full blood examination, plasma folic acid in  $\text{nmol}/\text{l}$  and plasma vitamin B12 in  $\text{pmol}/\text{l}$
2. Lipids: Serum total cholesterol, triglycerides, HDL-cholesterol, and LDL-cholesterol<sup>5</sup> in  $\text{mmol}/\text{l}$